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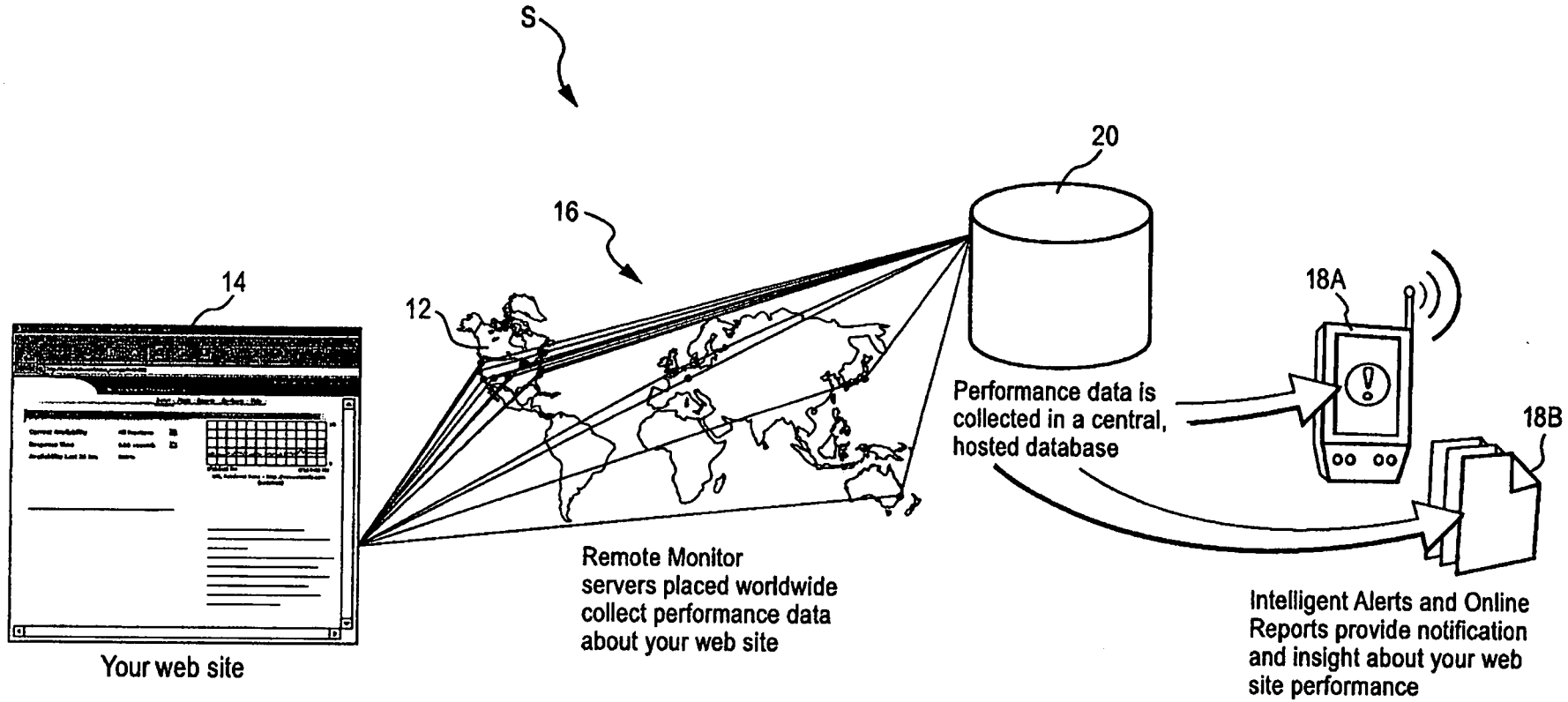

Fig. 1

0073ar 4090460

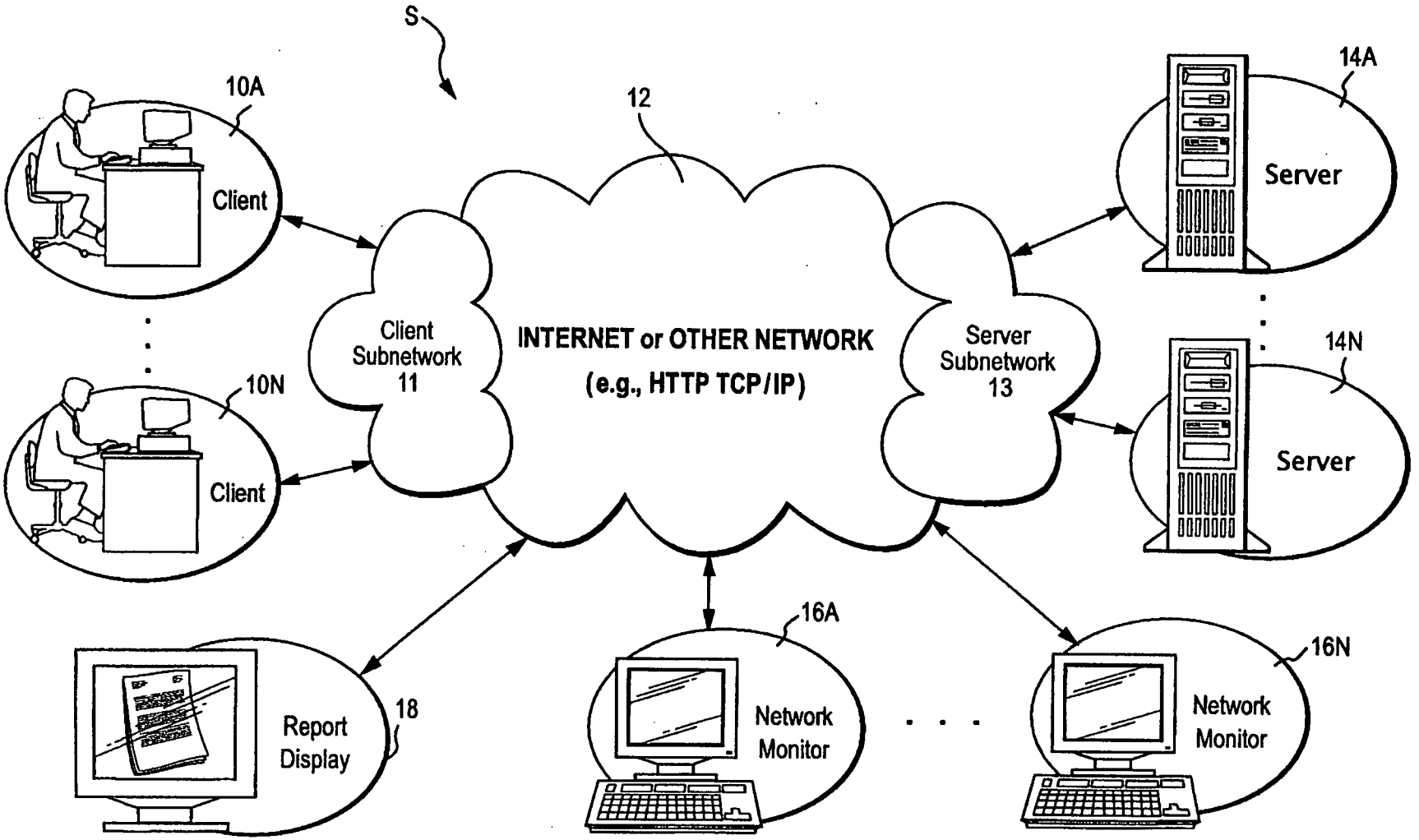

Fig. 2

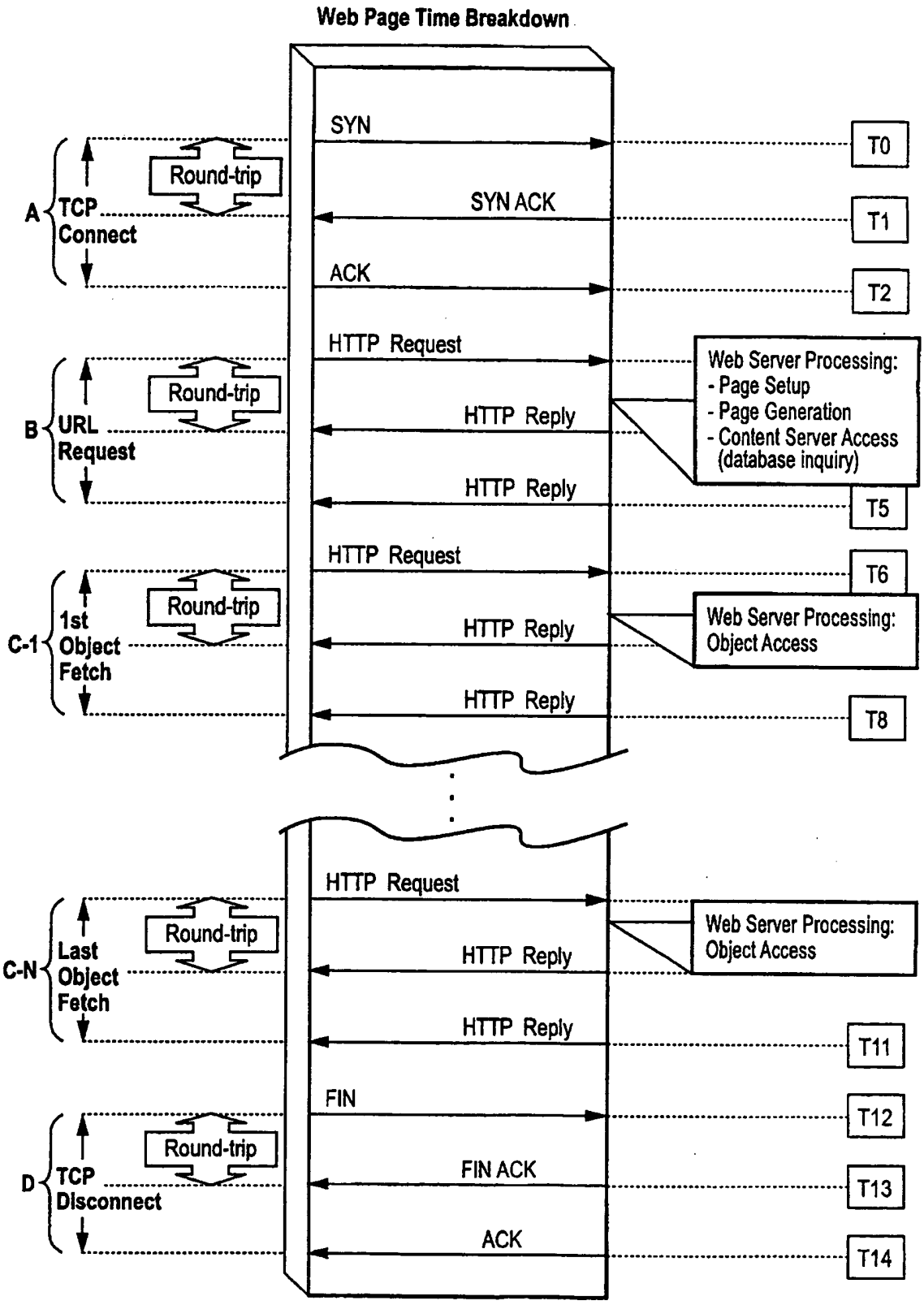
Web Page Time Breakdown
SYN
SYN ACK
ACK
HTTP Request
HTTP Reply
HTTP Reply
HTTP Request
HTTP Reply
HTTP Reply
HTTP Request
HTTP Reply
HTTP Reply
FIN
FIN ACK
ACK
Round-trip
Round-trip
Round-trip
Round-trip
A TCP Connect
B URL Request
C-1 1st Object Fetch
C-N Last Object Fetch
D TCP Disconnect
T0
T1
T2
T5
T6
T8
T11
T12
T13
T14
Web Server Processing:
- Page Setup
- Page Generation
- Content Server Access (database inquiry)
Web Server Processing: Object Access
Web Server Processing: Object Access

Fig. 3

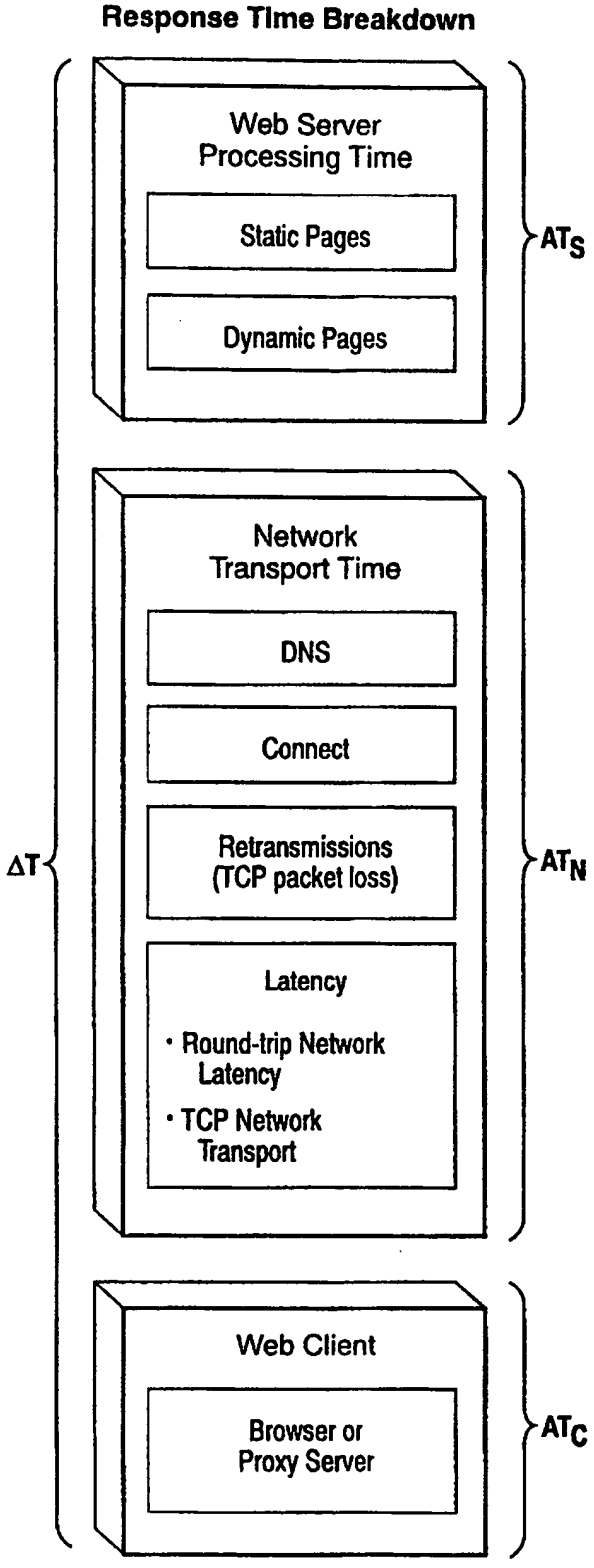
Response Time Breakdown
Web Server
Processing Time
Static Pages
Dynamic Pages
ATS
Network
Transport Time
DNS
Connect
Retransmissions
(TCP packet loss)
Latency
• Round-trip Network Latency
• TCP Network Transport
ATN
ΔT
Web Client
Browser or
Proxy Server
ATC

Fig. 4

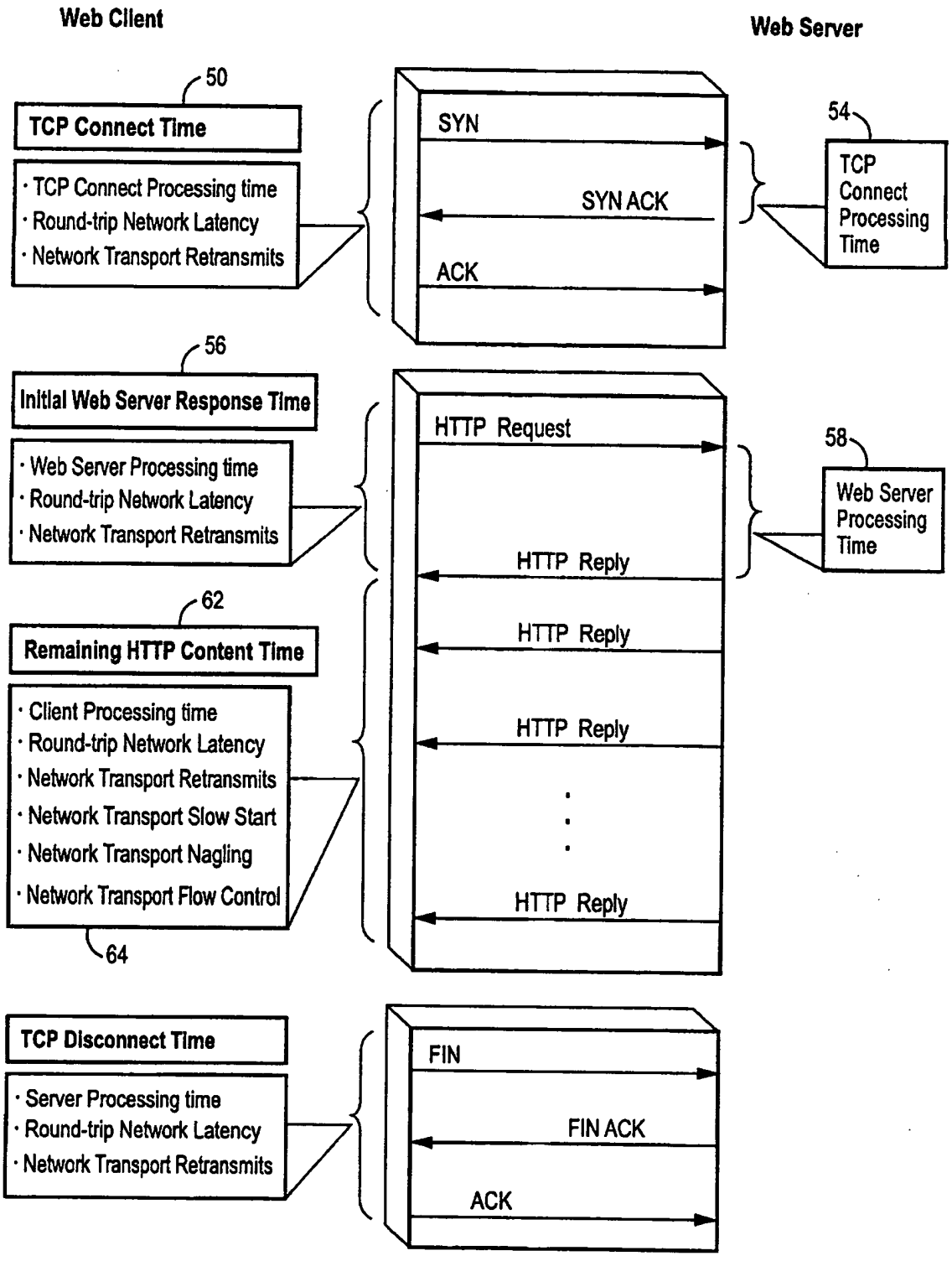
Web Client
Web Server
50
TCP Connect Time
· TCP Connect Processing time
· Round-trip Network Latency
· Network Transport Retransmits
SYN
SYN ACK
ACK
54
TCP Connect Processing Time
56
Initial Web Server Response Time
· Web Server Processing time
· Round-trip Network Latency
· Network Transport Retransmits
HTTP Request
HTTP Reply
58
Web Server Processing Time
62
Remaining HTTP Content Time
· Client Processing time
· Round-trip Network Latency
· Network Transport Retransmits
· Network Transport Slow Start
· Network Transport Nagling
· Network Transport Flow Control
64
HTTP Reply
HTTP Reply
HTTP Reply
HTTP Reply
TCP Disconnect Time
· Server Processing time
· Round-trip Network Latency
· Network Transport Retransmits
FIN
FIN ACK
ACK

Fig. 5

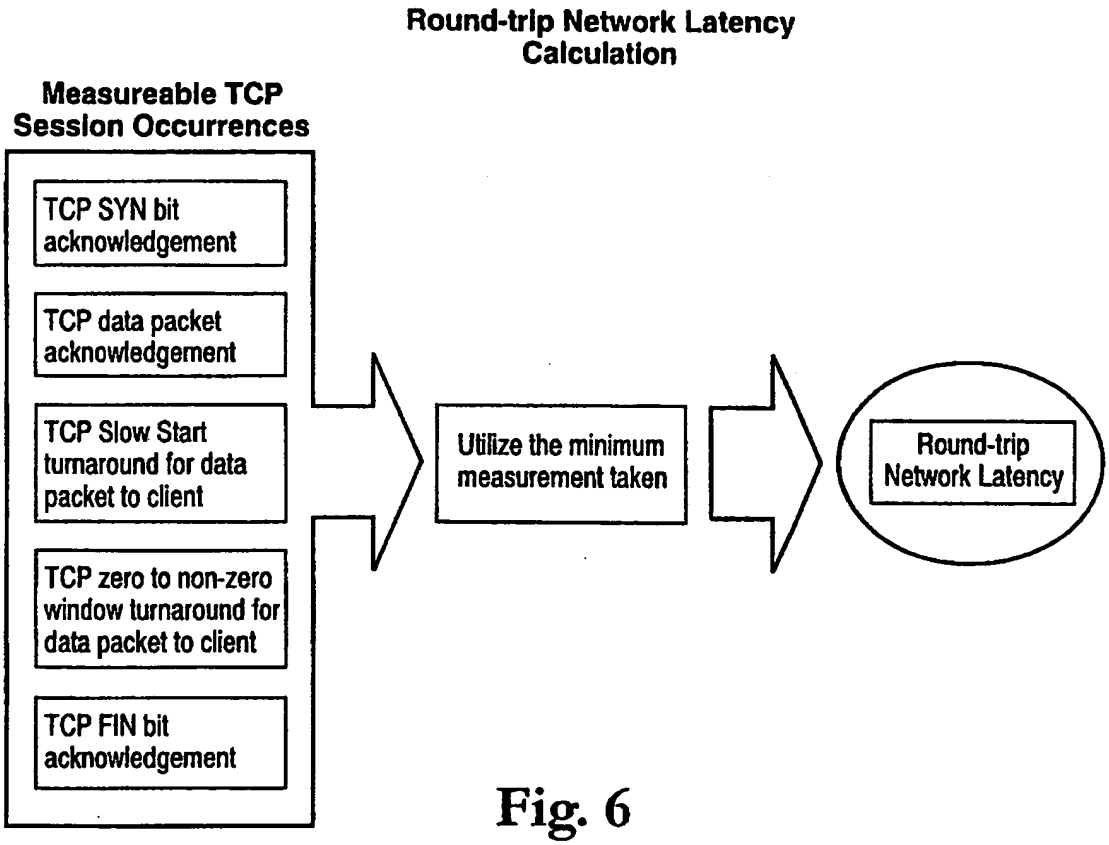

Fig. 6

Example Connect Time Metric 'Bucket' Breakdown

0ms - 500ms	500ms - 1 second	1 second - 3 seconds	4 seconds or higher
7840	529	9	1

Fig. 8

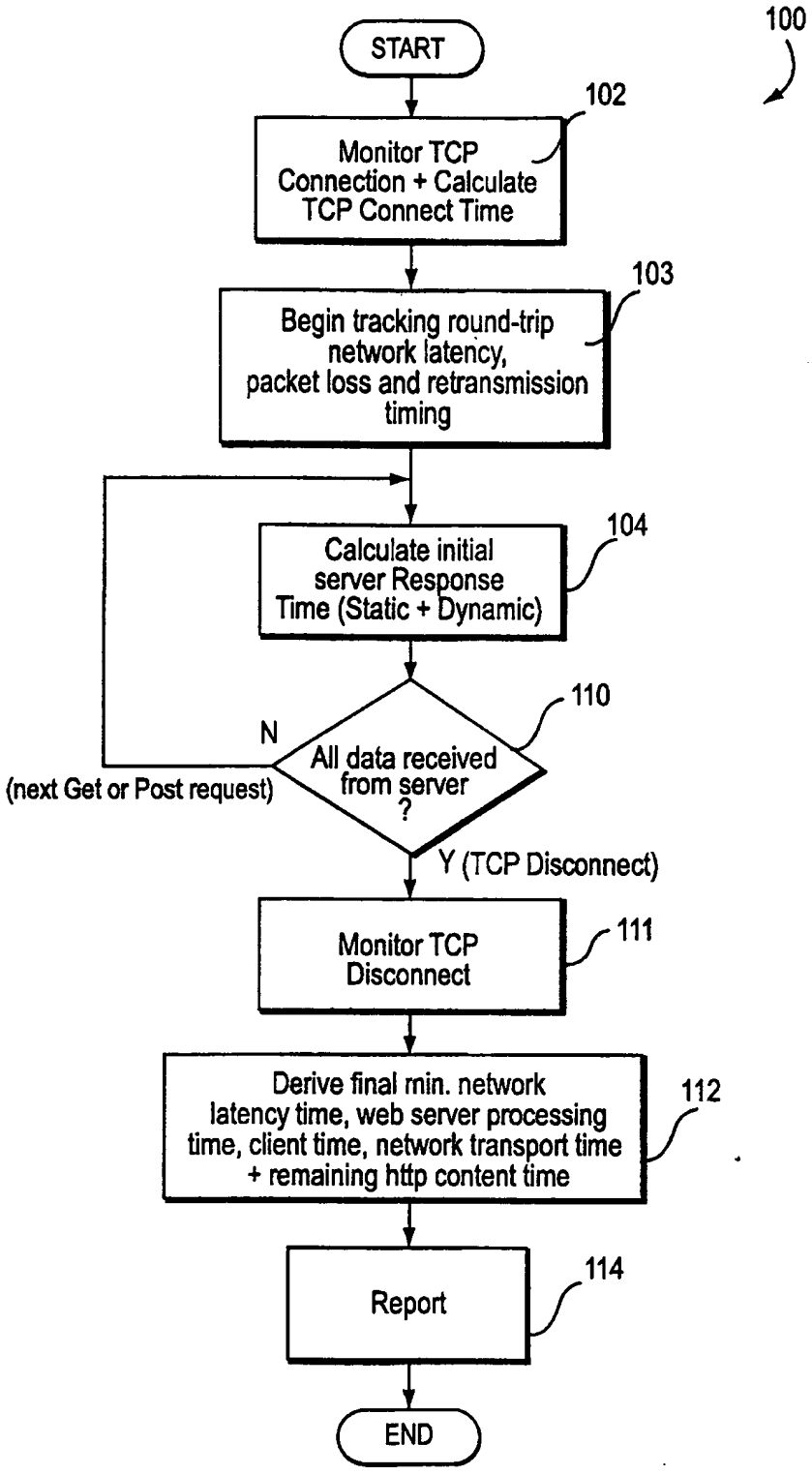
100
START
102
Monitor TCP Connection + Calculate TCP Connect Time
103
Begin tracking round-trip network latency, packet loss and retransmission timing
104
Calculate initial server Response Time (Static + Dynamic)
110
All data received from server ?
N
(next Get or Post request)
Y (TCP Disconnect)
111
Monitor TCP Disconnect
112
Derive final min. network latency time, web server processing time, client time, network transport time + remaining http content time
114
Report
END

Fig. 7

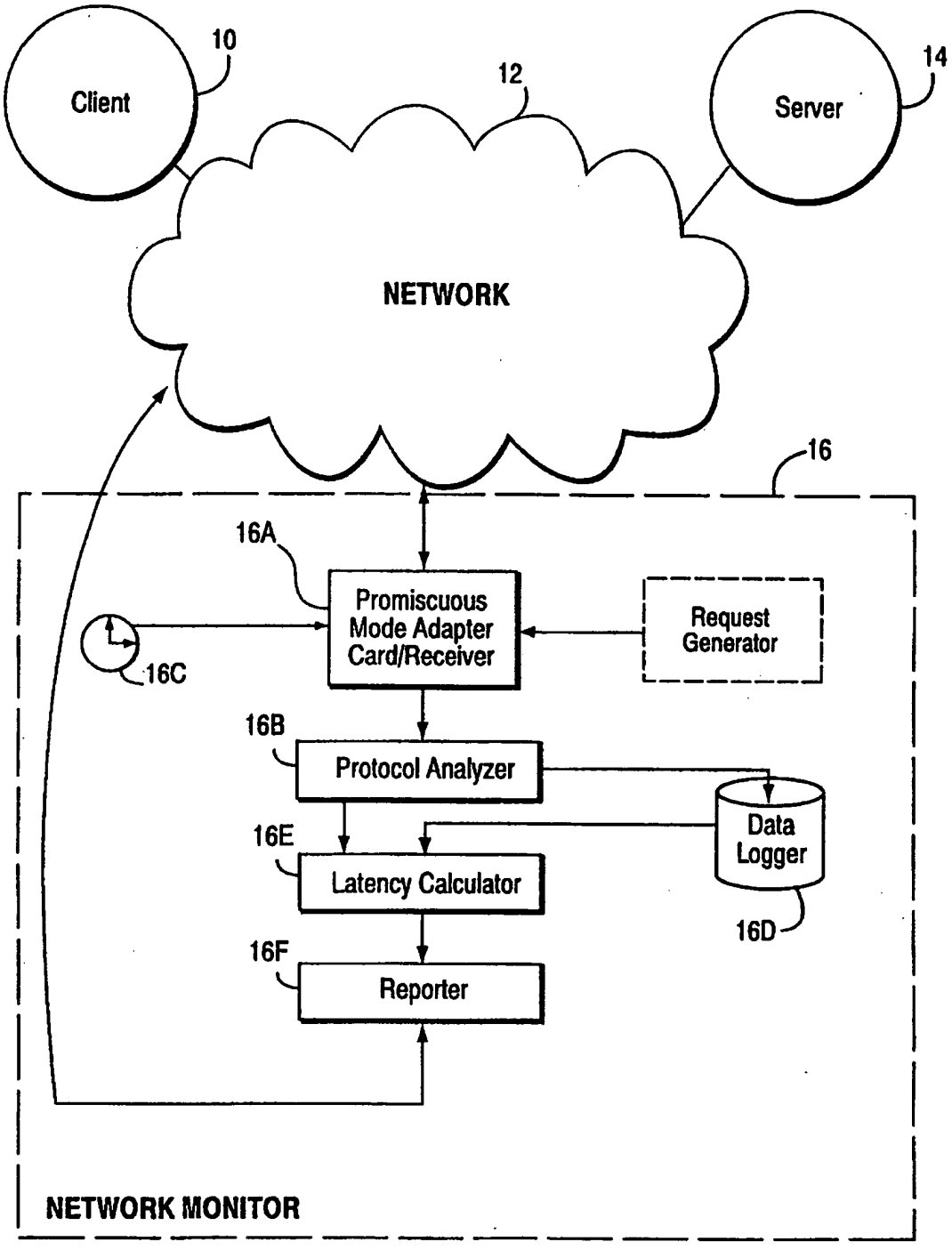

Fig. 9 Example Network Monitor Architecture

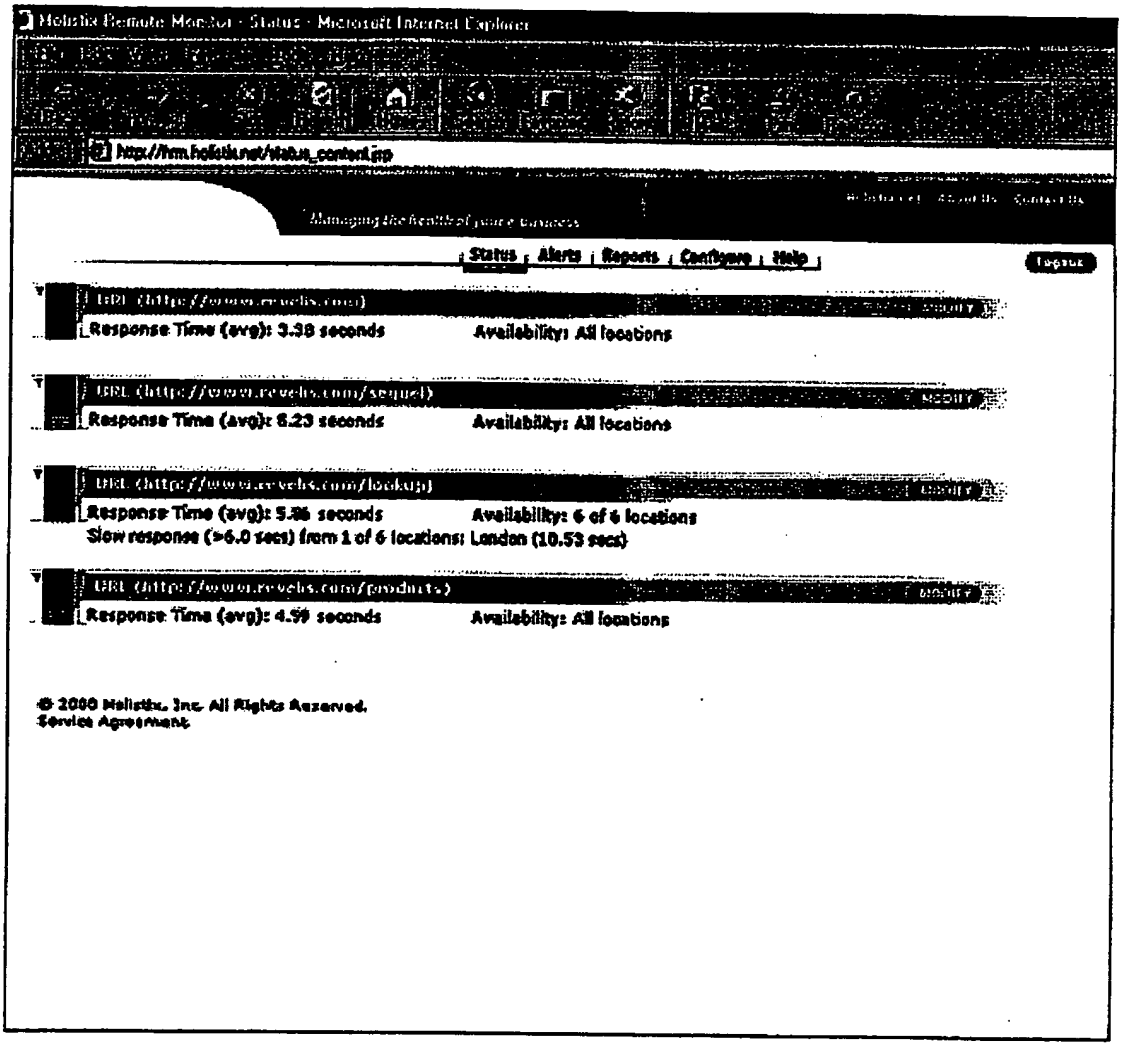

Fig. 10A

Best Available Copy

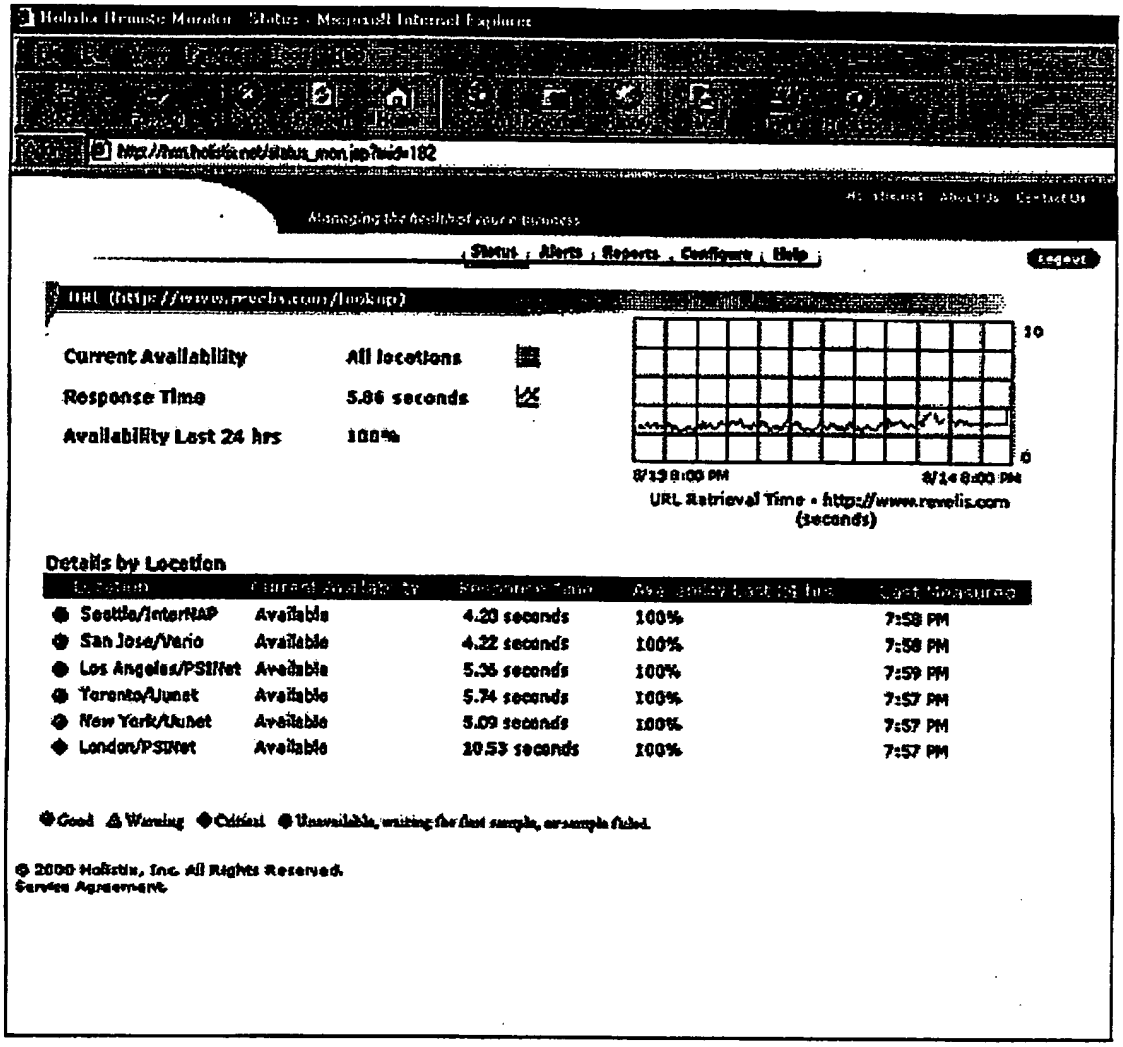

Fig. 10B

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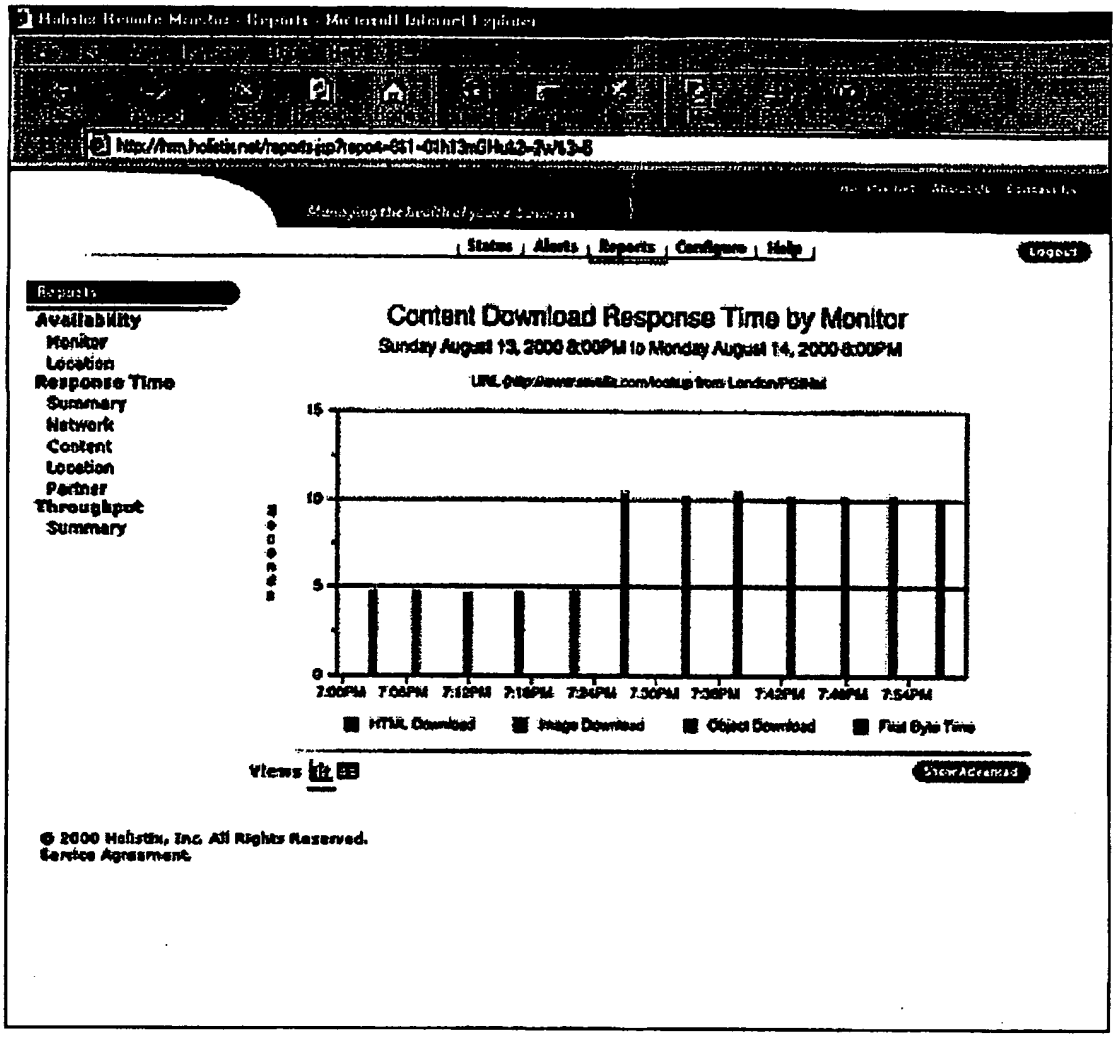

Fig. 10C

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